WATER QUALITY CHECKER CIRCUIT

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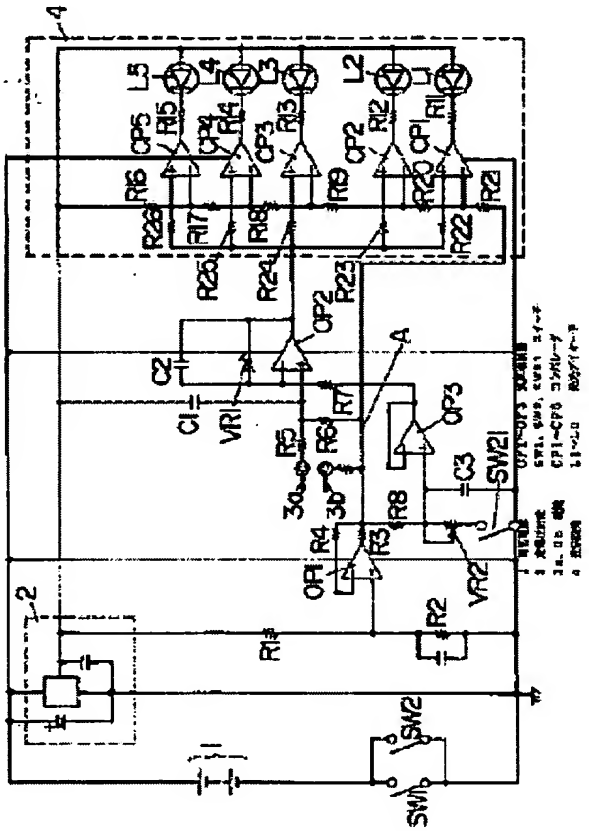
Abstract of **JP2002214220**

PROBLEM TO BE SOLVED: To provide a water quality checker circuit capable of checking not only alkalinity but also the concentration of chlorine and capable of evaluating and displaying the concentration of chlorine and alkalinity by a display means even at the time of measurement of both of the concentration of chlorine and alkalinity when water quality is evaluated and displayed by the display means.
SOLUTION: If a switch SW2 is closed at the time of measurement of alkalinity, a switch SW21 is closed in connection with the on-operation of the switch SW2 and, since the voltage at the non-reversal input terminal of an operational amplifier OP3 becomes voltage divided by a resistor R8 and a variable resistor VR2, the potential of the output terminal of the operational amplifier OP3 becomes lower than that of a line A in a negative direction as compared with the voltage at the time of measurement of the concentration of chlorine.



CLAIMS

[Claim(s)]

[Claim 1] A power source and the electrode of the couple which generates an electrical potential difference and is outputted as a detection signal when it is constituted by the metal of a different kind and soaks into the liquid for detection, When it soaks into the liquid for [of the level of chlorine] detection, it becomes the minus side of an electromotive voltage. A means for while to become the plus side of an electromotive voltage, to look at the potential of the connection line which connects an electrode from the minus gland of the above-mentioned power source, and to hold to fixed potential when it soaks into the liquid for [of an alkali degree] detection, The operational amplifier for signal magnification which carries out noninverting magnification of the detection signal on the gain which becomes settled in the resistance connected between the resistance and the reversal input edge which inputted the above-mentioned detection signal into the noninverting input edge, and connected with the outgoing end and the reversal input edge, and the gland, It is prepared corresponding to the partial pressure output from which the plurality outputted from the partial pressure circuit constituted by the series circuit of two or more resistance connected between the plus pole of the above-mentioned power source and the above-mentioned connection line differs. Two or more comparators which reference voltage is set up with a different partial pressure output, respectively, and compare this reference voltage with the detection signal level outputted from the above-mentioned operational amplifier, While having a display means to be established corresponding to this each comparator, to be connected between the outgoing end of each comparator, and the above-mentioned power source, to drive according to the output of the above-mentioned comparator which carries out a response, and to display a detection result Potential of the gland of the above-mentioned operational amplifier is made into the potential of the above-mentioned connection line at the time of chlorine density measurement. Until the alkali degree which equips with and measures the means which carries out change-over setting out low results in the minus direction from from more than predetermined rather than the potential of the above-mentioned connection line below predetermined at the time of alkali degree measurement, when high change of the detection signal level outputted from the above-mentioned operational amplifier when the level of chlorine to measure is abbreviation 0, until it results from from more than predetermined concentration —

abbreviation -- the water quality checker circuit characterized by setting up the gain of the above-mentioned operational amplifier so that it may become the same.

[Claim 2] the electrical potential difference which lowered the pressure of the electrical potential difference of the above-mentioned power source for a means hold the potential of the above-mentioned connection line uniformly, on the predetermined electrical potential difference -- a noninverting input edge -- inputting -- abbreviation -- another operational amplifier which constitutes the non-inversed amplifier with which gain was set up so that the same electrical potential difference may be generated in an output -- constituting -- this -- the water-quality checker circuit according to claim 1 characterized by to connect the above-mentioned connection line to the outgoing end of another operational amplifier, and to grow into it.

[Claim 3] The water-quality checker circuit according to claim 1 or 2 characterized by to have constituted from an electrical-potential-difference means for switching which switches the electrical potential difference inputted into the noninverting input edge of other operational amplifiers to which the reversal input edge and the outgoing end were connected, and these operational amplifiers of other as the above-mentioned means for switching to the electrical potential difference of the above-mentioned connection line, and an electrical potential difference lower than this connection line, and to make potential of the outgoing end of an operational amplifier besides the above into the ground potential of the operational amplifier for the above-mentioned signal magnification.

[Claim 4] Claim 1 characterized by turning on a comparator with the low detection signal level which inputs reference voltage into the reversal input edge of each above-mentioned comparator, respectively, and inputs the detection signal level from the operational amplifier for the above-mentioned signal magnification into the noninverting input edge of each above-mentioned comparator from reference voltage, and operating the above-mentioned display means thru/or the water quality checker circuit of any of 3, or a publication.

[Claim 5] Claim 1 characterized by for the above-mentioned power source constituting with the output of the voltage stabilizer which stabilizes a cell power source, and changing thru/or the water quality checker circuit of a publication of any of 4, or a publication.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the water quality checker circuit which can be used for the level of chlorine of tap water, and any check of the alkali degree of alkali generation water.

[0002]

[Description of the Prior Art] Although there are some which check the level of chlorine or the alkali degree in liquid with the electromotive voltage of the electrode of a couple conventionally Since the direction of an electromotive voltage inter-electrode in the case where the level of chlorine is measured, and the time of measurement of an alkali degree is reverse, If the level of chlorine tends to indicate by assessment abbreviation 0, i.e., beautiful water, and that an alkali degree is "good" using the same light emitting diode more than predetermined when both a certain liquid estimates it as "good" Since the direction of an electromotive voltage was reverse, there was a problem that the circuitry for detection signal processing became complicated.

[0003]

[Problem(s) to be Solved by the Invention] When it succeeded in this invention in view of the above-mentioned trouble, the place made into the object can check an alkali degree and the level of chlorine and water quality moreover indicates by assessment with a display means, it is in offering the water quality checker circuit which can indicate by assessment with the display means same also at the time of measurement [which / of the level of chlorine and an alkali degree].

[0004]

[Means for Solving the Problem] In order to attain the above-mentioned object, in invention of claim 1 A power source and the electrode of the couple which generates an electrical potential difference and is outputted as a detection signal when it is constituted by the metal of a different kind and soaks into the liquid for detection, When it soaks into the liquid for [of the level of chlorine] detection, it becomes the minus side of an electromotive voltage. A means for while to become the plus side of an electromotive voltage, to look at the potential of the connection line which connects an electrode from the minus gland of the above-mentioned power source, and to hold to fixed potential when it soaks into the liquid for [of an alkali degree] detection, The operational amplifier for signal magnification which carries out noninverting magnification of the detection signal on the gain which becomes settled in the resistance connected between the resistance and the reversal input edge which inputted the above-mentioned detection signal into the noninverting input edge, and

connected with the outgoing end and the reversal input edge, and the gland, It is prepared corresponding to the partial pressure output from which the plurality outputted from the partial pressure circuit constituted by the series circuit of two or more resistance connected between the plus pole of the above-mentioned power source and the above-mentioned connection line differs. Two or more comparators which reference voltage is set up with a different partial pressure output, respectively, and compare this reference voltage with the detection signal level outputted from the above-mentioned operational amplifier, While having a display means to be established corresponding to this each comparator, to be connected between the outgoing end of each comparator, and the above-mentioned power source, to drive according to the output of the above-mentioned comparator which carries out a response, and to display a detection result Potential of the gland of the above-mentioned operational amplifier is made into the potential of the above-mentioned connection line at the time of chlorine density measurement. Until the alkali degree which equips with and measures the means which carries out change-over setting out low results in the minus direction from from more than predetermined rather than the potential of the above-mentioned connection line below predetermined at the time of alkali degree measurement, when high change of the detection signal level outputted from the above-mentioned operational amplifier when the level of chlorine to measure is abbreviation 0, until it results from from more than predetermined concentration -- abbreviation -- it is characterized by setting up the gain of the above-mentioned operational amplifier so that it may become the same.

[0005] the electrical potential difference which lowered the pressure of the electrical potential difference of the above-mentioned power source on a predetermined electrical potential difference for a means hold the potential of the above-mentioned connection line uniformly, in invention of claim 1 in invention of claim 2 -- a noninverting input edge -- inputting -- abbreviation -- another operational amplifier which constitutes the non-inversed amplifier with which gain was set up so that the same electrical potential difference may generate in an output -- constituting -- this -- it carries out connecting the above-mentioned connection line to the outgoing end of another operational amplifier, and growing into it as the description.

[0006] It constitutes from an electrical-potential-difference means for switching which switches the electrical potential difference inputted into the noninverting input edge of other operational amplifiers to which the reversal input edge and the outgoing end were connected, and these operational amplifiers of other as the above-mentioned means for switching to the electrical potential difference of the

above-mentioned connection line, and an electrical potential difference lower than this connection line, and it is characterized in claim 1 or invention of 2 in invention of claim 3 by to make the potential of the outgoing end of an operational amplifier besides the above into the ground potential of the operational amplifier for the above-mentioned signal magnification.

[0007] In invention of claim 4, it is characterized by turning on a comparator with the low detection signal level which inputs reference voltage into the reversal input edge of each above-mentioned comparator, respectively, and inputs the detection signal level from the operational amplifier for the above-mentioned signal magnification into the noninverting input edge of each above-mentioned comparator from reference voltage, and operating the above-mentioned display means in claim 1 thru/or invention [which / of 3].

[0008] In invention of claim 5, it is characterized by for the output of the voltage stabilizer where the above-mentioned power source stabilizes a cell power source constituting, and changing in claim 1 thru/or invention [which / of 4].

[0009]

[Embodiment of the Invention] One operation gestalt explains this invention below.

[0010] Drawing 1 shows the circuit of this operation gestalt, and connects the voltage stabilizer 2 which consists of a general-purpose IC etc. through the parallel circuit of the switch SW1 for chlorine density measurement initiation, and the switch SW2 for measurement initiation of an alkali degree to the cell power sources 1, such as a dry cell and a rechargeable battery, in drawing. It is impressed by the noninverting input edge of the operational amplifier OP1 which obtains the supply voltage stabilized by this voltage stabilizer 2, pressures this electrical potential difference partially by the resistance partial pressure circuit of resistance R1 and R2, and constitutes a non-inversed amplifier. The middle point potential of the series circuit of the resistance R3 and R4 connected between the outgoing end of this operational amplifier OP1, and the reversal input edge While making water quality assessment into the grand level of the reference voltage of the comparators CP1-CP5 of the display circuit 4 for displaying gradually, it is considering as the grand level of the detection signal level by the electromotive force generated between electrode 3for sensors a, and 3b.

[0011] Between electrode 3a and 3b, the series circuit of resistance R5 and R6 is connected, and the middle point of this series circuit is connected to the noninverting input edge of the operational amplifier OP2 for detecting-signal magnification. This noninverting input edge is connected also to the plus pole side of the outgoing end of

the above-mentioned voltage stabilizer 2 through the capacitor C1.

[0012] Gain is set up by the resistance R7 which constitutes a non-inversed amplifier, has connected the parallel circuit which consists of a variable resistor VR 1 and a capacitor C2 for response adjustment between the outgoing end and the reversal input edge, and connected between the resistance of this variable resistor VR 1, and the outgoing end of the operational amplifier OP3 used as a reversal input edge and a gland (criteria) mentioned later, and this gain can adjust [a variable resistor VR 1] an operational amplifier OP2 now.

[0013] Moreover, while, connecting the series circuit of a switch SW21 with a variable resistor VR 2 through resistance R8 between the middle point of the series circuit of the above-mentioned resistance R3 and R4, and the minus pole of the cell power source 1 on the other hand, the capacitor C3 for noise rejection is connected to the series circuit of a variable resistor VR 2 and a switch SW21, and the noninverting input edge of an operational amplifier OP3 is connected with resistance R8 at the node of a variable resistor VR 2.

[0014] This operational amplifier OP3 constitutes the non-inversed amplifier of a voltage follower, the input voltage of a noninverting input edge and its output voltage are equal, it connects that outgoing end to the reversal input edge of the above-mentioned operational amplifier OP2 through resistance R7, and sets the potential of the gland of an operational amplifier OP2 as the potential of an outgoing end.

[0015] The above-mentioned switch SW21 is ON / switch of which interlocks off and ON/OFF is done of the switch SW2 for alkali degree measurement initiation, and constitutes the means for switching of the input voltage of an operational amplifier OP2.

[0016] The display circuit 4 consists of five comparators CP1-CP5, light emitting diode L1 which constitutes the display means connected through current-limiting resistors R11-R15 between the plus poles of the outgoing end of these comparators CP1-CP5, and the outgoing end of a voltage stabilizer 2 - L5 grade. And the partial pressure circuit which consists of a series circuit of the resistance R16-R21 of the same resistance between the plus pole of the outgoing end of the above-mentioned voltage stabilizer 2 and the middle point of the series circuit of the above-mentioned resistance R3 and R4 is connected. The partial pressure electrical potential difference of the node of resistance R21 and resistance R20 is connected to the reversal input edge of a comparator CP 1 as reference voltage. Moreover, the partial pressure electrical potential difference of the node of resistance R20 and resistance R19 is

connected to the reversal input edge of a comparator CP 2 as reference voltage. Furthermore, the partial pressure electrical potential difference of the node of resistance R19 and resistance R18 is connected to the reversal input edge of a comparator CP 3 as reference voltage. The partial pressure electrical potential difference of the node of resistance R18 and resistance R17 is similarly connected to the reversal input edge of a comparator CP 4 as reference voltage. Furthermore, the partial pressure electrical potential difference of the node of resistance R17 and resistance R16 is connected to the reversal input edge of a comparator CP 5 as reference voltage, and from the reference voltage of a comparator CP 1 to the reference voltage of a comparator CP 5 is raised gradually one by one.

[0017] On the other hand, the outgoing end of the above-mentioned operational amplifier OP2 is connected to the noninverting input edge of comparators CP1-CP5 through resistance R22-R26, respectively, and the thing of the resistance with these same resistance R22-R26 is used.

[0018] While the housing 5 which drawing 2 shows the appearance of the water quality checker who used this invention water quality checker circuit, and consists of resin mold goods carries out the inner package of the circuit and the cell power source 1 which are shown by drawing 1 The body section 6 in which the control unit of switches SW1 and SW2 and the light-emitting part of the light emitting diodes L1-L5 of a display circuit 4 were ****(ed) outside, It consists of the head sections 7 in which the sensor section which was formed so that it might project ahead from the anterior part of the body section 6, and which turns into a point from the electrodes 3a and 3b of a couple is prepared.

[0019] This housing 5 is formed with resin mold goods, such as ABS plastics, preferably [forming with the construction material which does not contain exogenous endocrine disrupting chemicals (environmental hormone)].

[0020] Moreover, the head section 7 is formed in the cross direction in the shape of [long] a cylinder, the centrum of the interior is open for free passage in the body section 6 in a back end side, and the front end side is carrying out opening towards the front. As shown in the front end section of the head section 7 at drawing 4, the perimeter of the periphery of opening is covered here. While the fitting rib 8 of the shape of a cylinder which has an outer-diameter dimension smaller than the outer-diameter dimension of the head section 7 is formed while projecting ahead, and covering the peripheral face of this fitting rib 8 at the perimeter and cutting the fitting crevice 9 The front end side is formed rather than the fitting crevice 9 as fitting heights 10 which projected in the periphery side rather than the fitting crevice 9.

[0021] The point of the head section 7 is equipped with the holddown member 11 for fixing the terminal electrodes 3a and 3b while securing the internal and external watertightness of the head section 7. Forming a holddown member 11 with the construction material which does not contain environmental hormone forms the lobe 13 of the shape of a cylinder of a minor diameter in the desirable for example, front end side of the stop section 12 which is formed with resin mold goods, such as ABS plastics, and was formed in the shape of a cylinder rather than the stop section 12, and the insertion section 14 of the shape of a cylinder of a minor diameter is formed in the back end side of the stop section 12 rather than the stop section 12.

[0022] After forming the side crevice 15 and carrying out opening to the insertion section 14 in back before carrying out opening to a lobe 13 ahead at this time, the side crevice 22 is formed, and the before [this] side crevice 15 and the backside crevice 22 are divided by the stop section 12.

[0023] Moreover, two insertion holes 16 which open the before side crevice 15 and the backside crevice 22 for free passage are formed in this stop section 12. Moreover, the concave 17 covering the perimeter is formed in the peripheral face of the insertion section 14 of a holddown member 11.

[0024] This holddown member 11 is attached in the front end of the head section 7 by inserting the insertion section 14 from front end opening of the head section 7 of housing 5, as shown in drawing 2 , and it can secure the watertightness between the outside surface of the insertion section 14, and the inner surface of the head section 7 by attaching O ring 18 in the insertion section 14 at this time.

[0025] Furthermore, by filling up the clearance between the outside surface of the insertion section 14, and the inner surface of the head section 7 with adhesives, and pasting up the head section 7 and a holddown member 11, while fixing a holddown member 11 firmly to the head section 7, the watertightness between the outside surface of the insertion section 14 and the inner surface of the head section 7 can be improved further.

[0026] Two lead wire 19a and 19b is arranged in the hollow circles of the head section 7, the back end section of each lead wire 19a and 19b is pulled out by the body section 6 of housing 5, and is connected to a control section, and the front end section is being fixed to the holddown member 11. Moreover, Electrodes 3a and 3b are connected at the head of two lead wire 19a and 19b, respectively.

[0027] Here, lead wire 19a and 19b is inserted in the insertion hole 16 of the stop section 12 of a holddown member 11, and the back end side is pulled out behind the holddown member 11 through back end opening from the inside of the backside [the

insertion section 14] crevice 22. Moreover, the spherical larger phyma section 20 than the bore of the insertion hole 16 is formed in the end at the head of lead wire 19a and 19b, and the head of lead wire 19a and 19b is stopped by this phyma section 20 in the before [a lobe 13] side crevice 15 at the front-face side of the stop section 12. The back end of the linear electrodes 3a and 3b is laid under the phyma section 20 at the head of these lead wire 19a and 19b, respectively, and, thereby, Electrodes 3a and 3b are connected at the head of lead wire 19a and 19b. It is arranged so that a head side may project ahead from opening of the before [the lobe 13 of a holddown member 11] side crevice 15 as for each electrodes 3a and 3b.

[0028] Moreover, it fills up with the sealing agent 21 in the backside [the insertion section 14 of a holddown member 11] crevice 22, and, thereby, lead wire 19a and 19b is being fixed in the backside [the insertion section 14 of a holddown member 11] crevice 22. Moreover, it fills up with the sealing agent 23 also in the before [the lobe 13 of a holddown member 11] side crevice 15, and, thereby, Electrodes 3a and 3b are being fixed in the before [the lobe 13 of this holddown member 11] side crevice 15. Moreover, the watertightness between the front end side of a holddown member 11 and a back end side is secured with these sealing agents 23 and 19.

[0029] Electrode 3a of a platinum wire and another side is formed for one electrode 3b with the silver wire, and, as for the electrodes 3a and 3b of a couple, the sensor section is constituted by these electrodes 3a and 3b. Each electrodes 3a and 3b are formed by the back end side in the before [the lobe 13 of a holddown member 11] side crevice 15 as the laying-under-the-ground section currently laid underground in the sealing agent 23, and the front end side is formed as a detection part which projects towards the front from this sealing agent 23.

[0030] A silver chloride coat is formed only in the front face of the detection terminal area 7 at electrode 3a which consists of a silver wire, the silver chloride coat is not formed in the front face of the laying-under-the-ground section, for this reason, a silver chloride coat is not formed in the connection of electrode 3a and lead-wire 19a, and the electrical installation of electrode 3a and lead-wire 19a is not checked with a silver chloride coat.

[0031] Furthermore, the cap object 24 is established at the head of the head section 7 so that a holddown member 11 and the detection terminal area 7 of Electrodes 3a and 3b may be covered, and thereby, protection of the detection terminal area 7 is performed. As this cap object 24 is shown in drawing 3 , while a front end side blockades, the back end side is formed in the shape of [which carried out opening] a closed-end cylinder, and that outer-diameter dimension is formed in the

outer-diameter dimension and abbreviation identitas of the head section 7. Moreover, an inside diameter is larger than a front end side, and the back end section of the cap object 24 was formed in the outer diameter of the stop section 12 of a holddown member 11, and the dimension of abbreviation identitas. While being formed as a fitting-ed rib 25 and forming the fitting-ed crevice 26 which covers the inner skin of the back end section of this fitting-ed rib 25 at the perimeter, and agrees in the fitting heights 10 of the fitting rib 8 of the head section 7 The back end side is formed more nearly further than this fitting-ed crevice 26 rather than the fitting-ed crevice 26 as fitting-ed heights 27 corresponding to the fitting crevice 9 of the fitting rib 8 which projected in the inner circumference side. And it arranges from the periphery side of the stop section 12 of a holddown member 11, fitting-ed covering [of the cap object 24 / 25] it over the periphery side of the fitting rib 8 of the head section 7. By carrying out fitting of the fitting heights 10 and the fitting-ed crevice 26, while carrying out fitting of the fitting crevice 9 and the fitting-ed heights 27 By attaching the cap object 24 in the front end of the head section 7, filling up the clearance between the fitting rib 8 and the fitting-ed rib 25 with adhesives at this time, and pasting up the cap object 24 and the head section 7 While fixing the cap object 24 firmly to the head section 7, the watertightness between the fitting rib 8 and the fitting-ed rib 25 is securable.

[0032] The opening 28 of the two parallel shape of a parallel slit is formed in this cap object 24, and the inside and the outside of the cap object 24 are opened for free passage by this opening 28. This opening 28 is formed so that the side face of an opposite hand may be covered through a front end side from the side face of the cap object 24. Moreover, while it is open for free passage with this opening 28 to the both ends of each opening 28, to them, the free passage hole 29 which opens the inside and the outside of the cap object 24 for free passage is formed in the cap object 24, and this free passage hole 29 is formed in the major diameter rather than the width of face of each opening 28.

[0033] The opening 28 of the shape of a slit of this cap object 24 is for making the liquid for [, such as tap water,] detection invade inside the cap object 24 at the time of measurement of water quality, making the detection terminal area 7 of an electrode 2 immersed in this liquid, or discharging a liquid from the inside of the cap object 24 after measurement of water quality.

[0034] Moreover, the free passage hole 6 is to discharge air from the inside of the cap object 24 at the time of measurement of water quality, and make it the liquid for detection invade smoothly inside the cap object 24, or make air invade inside the cap

object 24 after measurement of water quality, and discharge a liquid smoothly from the inside of the cap object 24.

[0035] Next, actuation of the water quality checker circuit of this operation gestalt is explained.

[0036] In checking the level of chlorine of tap water first, a switch SW1 is turned on and it soaks the head section 7 in the tap water which is the liquid for [detected]. Between electrode 3a within the cap object 24 soaked in tap water, and 3b, an electromotive voltage occurs according to the level of chlorine. in this case, electrode 3a -- a plus pole -- becoming -- an electromotive voltage -- resistance R6 -- an electrical potential difference -- generating -- this electrical potential difference -- a detecting signal -- ** -- it carries out, and it is inputted into an operational amplifier OP2 at a noninverting input edge, and noninverting magnification is carried out.

[0037] On the other hand, the partial pressure of the output voltage from a voltage stabilizer 2 is carried out, the pressure of it is lowered by resistance R1 and resistance R2, and noninverting magnification of the ends electrical potential difference of resistance R2 is carried out by the operational amplifier OP1. It has set up so that the electrical potential difference of the connection line A where the resistance of the resistance R4 and R3 connected to the outgoing end and reversal close ends of an operational amplifier OP1 here is connected at the middle point may carry out abbreviation etc. to the ends electrical potential difference of the abbreviation resistance R2 and may turn into input voltage.

[0038] Moreover, since a switch SW21 is an OFF state, in an operational amplifier OP3, the electrical potential difference of an outgoing end turns into the electrical potential difference inputted into the noninverting input edge, i.e., the electrical potential difference of the connection line A and an equal electrical potential difference. Therefore, since the potential of this outgoing end and the potential of the connection line A are equal, an operational amplifier OP2 amplifies the detection signal level generated to the ends of resistance R6 by the gain which becomes settled in the resistance of a variable resistor VR 1, and the resistance of the resistance R7 connected between the reversal input edge and the outgoing end of an operational amplifier OP3.

[0039] The detection signal level amplified by this operational amplifier OP3 is inputted into a display circuit 4, and is compared with the reference voltage set as each comparators CP1-CP5. And in the comparator with which the detection signal level is not over reference voltage, an outgoing end is made into "L" level and a luminescence current is passed to the light emitting diode connected to the outgoing

end. That is, the more the level of chlorine of measured water is high, the electromotive voltage generated between electrode 3a and 3b increases, and the ends electrical potential difference of resistance R6 becomes high, therefore the number of the comparators exceeding reference voltage increases, and, the more the number of the light emitting diodes which emit light decreases. Therefore, when all the light emitting diodes L1-L5 are on, the more the level of chlorine is close to abbreviation 0, water quality assessment serves as "good" and the number of burning decreases, the level of chlorine is high and, the more it turns out that water quality assessment is "wrong." Moreover, before soaking the head section 7 in tap water, a capacitor C1 will be charged from the event of switching on [SW1], light emitting diode L1-5 will carry out sequential burning slowly with that charge, and a check of operation will have come be made by this burning. It is this actuation only at the chlorine density measurement time, and this burning actuation does not exist at the time of the measurement of an alkali degree mentioned later.

[0040] Now, in addition to the level of chlorine of tap water, this invention checker circuit can also check the alkali degree of alkali generation water, turns on a switch SW2 in this case, and should just soak the head section 7 like the check of the level of chlorine of tap water in the liquid for detection.

[0041] That is, ON actuation of a switch SW2 is interlocked with, a switch SW21 turns on, and since the electrical potential difference of the noninverting input edge of an operational amplifier OP3 is switched to the electrical potential difference by which the partial pressure was carried out to resistance R8 with the variable resistor VR 2, as compared with the time of chlorine density measurement, the potential of the outgoing end of an operational amplifier OP3 becomes lower in the minus direction than the potential of the connection line A.

[0042] As the direction of the electromotive voltage between electrode 3a and 3b turns into an opposite direction with the time of chlorine density measurement on the other hand at the time of alkali measurement and an alkali degree becomes high, the detection signal level inputted into the noninverting input edge of an operational amplifier OP2 becomes larger in the minus direction to the potential of the connection line A.

[0043] So that it carries out the all-points LGT of the light emitting diodes L1-L5 more than predetermined in being high, and an alkali degree may make the light all put out here, when an alkali degree is lower than a predetermined degree Although the detection signal level which an alkali degree inputs into the noninverting input edge of an operational amplifier OP3 a high degree more than predetermined by setting up the

potential of the outgoing end of the above-mentioned operational amplifier OP3 with the variable resistor VR 2 increases in the minus direction on the basis of the connection line A By enlarging enough, the potential of the outgoing end of an operational amplifier OP3 in the minus direction rather than the potential of the connection line A the amplified detection signal level which is outputted from the outgoing end of an operational amplifier OP2 by the potential difference between the noninverting input edge of the operational amplifier OP2 which a detection signal inputs, and a gland becoming small -- the electrical potential difference of the connection line A -- receiving -- abbreviation -- it becomes a near value. By this, in a certain case, an alkali degree is [the input voltage of the noninverting input edge of all the comparators CP1-CP5] less than reference voltage more than predetermined, all of the output of comparators CP1-CP5 are set to "L" level, and all the light emitting diodes L1-L5 light up.

[0044] Moreover, as the alkali degree of the liquid for detection becomes low, the electromotive voltage of the minus direction becomes small, the detection signal level of the minus direction inputted into the noninverting input edge of an operational amplifier OP2 becomes small, the potential difference between the noninverting input edge of an operational amplifier OP2 and a gland becomes large, and the amplified detection signal level which is outputted from the outgoing end of an operational amplifier OP3 becomes larger. Therefore, the more the alkali degree of measured liquid is high, the number of the comparators with which the electrical potential difference of a noninverting input edge exceeds reference voltage increases, and, the more the number of the light emitting diodes which emit light decreases. That is, when all the light emitting diodes L1-L5 are on, there is an alkali degree more than predetermined and water quality assessment is "good", and the more the number of burning decreases conversely, the more it turns out that an alkali degree becomes small and water quality assessment serves as "wrong."

[0045] Although water quality assessment is expressed as a **** operation gestalt with the number of burning of light emitting diodes L1-L5, you may make it display using a liquid crystal display etc.

[0046]

[Effect of the Invention] The electrode of the couple which invention of claim 1 generates an electrical potential difference when it is constituted by the metal of a different kind and soaks into the liquid for detection, a power source and, and is outputted as a detection signal, When it soaks into the liquid for [of the level of chlorine] detection, it becomes the minus side of an electromotive voltage. A means

for while to become the plus side of an electromotive voltage, to look at the potential of the connection line which connects an electrode from the minus gland of the above-mentioned power source, and to hold to fixed potential when it soaks into the liquid for [of an alkali degree] detection, The operational amplifier for signal magnification which carries out noninverting magnification of the detection signal on the gain which becomes settled in the resistance connected between the resistance and the reversal input edge which inputted the above-mentioned detection signal into the noninverting input edge, and connected with the outgoing end and the reversal input edge, and the gland, It is prepared corresponding to the partial pressure output from which the plurality outputted from the partial pressure circuit constituted by the series circuit of two or more resistance connected between the plus pole of the above-mentioned power source and the above-mentioned connection line differs. Two or more comparators which reference voltage is set up with a different partial pressure output, respectively, and compare this reference voltage with the detection signal level outputted from the above-mentioned operational amplifier, While having a display means to be established corresponding to this each comparator, to be connected between the outgoing end of each comparator, and the above-mentioned power source, to drive according to the output of the above-mentioned comparator which carries out a response, and to display a detection result Potential of the gland of the above-mentioned operational amplifier is made into the potential of the above-mentioned connection line at the time of chlorine density measurement. Until the alkali degree which equips with and measures the means which carries out change-over setting out low results in the minus direction from from more than predetermined rather than the potential of the above-mentioned connection line below predetermined at the time of alkali degree measurement, when high change of the detection signal level of the above-mentioned operational amplifier when the level of chlorine to measure is abbreviation 0, until it results from from more than predetermined concentration -- abbreviation, since the gain of the above-mentioned operational amplifier was set up so that it might become the same The assessment display of water quality until it results [from the case of the abbreviation 0 for the level of chlorine of tap water] in predetermined concentration, Since it can carry out without the assessment display of water quality until it results [from more than predetermined / of an alkali degree, such as alkali generation water,] in below predetermined being able to carry out with the same display means, and moreover changing a comparator etc., It is effective in the water quality checker circuit which can perform measurement of the level of chlorine and measurement of an alkali

degree by the same electrode and easy circuitry being realizable.

[0047] Invention of claim 2 a means to hold the potential of the above-mentioned connection line uniformly, in invention of claim 1 Another operational amplifier which constitutes the non-inversed amplifier with which gain was set up so that the same electrical potential difference might be generated in an output constitutes. the electrical potential difference which lowered the pressure of the electrical potential difference of the above-mentioned power source on the predetermined electrical potential difference -- a noninverting input edge -- inputting -- abbreviation -- this -- since the above-mentioned connection line is connected to the outgoing end of another operational amplifier, the circuit which holds the potential of the gland of a detection signal level uniformly can be realized easily.

[0048] Invention of claim 3 is set to claim 1 or invention of 2. As the above-mentioned means for switching The electrical potential difference inputted into the noninverting input edge of other operational amplifiers to which the reversal input edge and the outgoing end were connected, and these other operational amplifiers is constituted from an electrical-potential-difference means for switching switched to the electrical potential difference of the above-mentioned connection line, and an electrical potential difference lower than this connection line. Since potential of the outgoing end of an operational amplifier besides the above was made into the ground potential of the operational amplifier for the above-mentioned signal magnification The circuit where the assessment display of water quality can perform similarly the time of chlorine density measurement and measurement of an alkali degree with the same display means as the operational amplifier for the same signal magnification and a comparator is realizable by the operational amplifier and the easy electrical-potential-difference means for switching.

[0049] Since invention of claim 4 turns on a comparator with the low detection signal level which inputs reference voltage into the reversal input edge of each above-mentioned comparator, respectively, and inputs the detection signal level from the operational amplifier for the above-mentioned signal magnification into the noninverting input edge of each above-mentioned comparator from reference voltage in claim 1 thru/or invention [which / of 3] and operates the above-mentioned display means, the effectiveness that the check of operation before measuring at the time of chlorine density measurement can do is.

[0050] Since the output of the voltage stabilizer where the above-mentioned power source stabilizes a cell power source constitutes from invention of claim 5 in claim 1 thru/or invention [which / of 4], the water quality checker circuit which operates

according to a cell power source can be offered.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the circuit diagram of 1 operation gestalt of this invention.

[Drawing 2] It is the side elevation of the water quality checker who used the same as the above.

[Drawing 3] a part of a water quality checker's head section where (a) used the same as the above -- it is an abbreviation **** expanded sectional view. a part of a water quality checker's head section where (b) used the same as the above -- it is an abbreviation **** amplification side elevation.

[Description of Notations]

1 Cell Power Source

2 Voltage Stabilizer

3a, 3b Electrode

4 Display Circuit

OP1-OP3 Operational amplifier

SW1, SW2, SW21 Switch

CP1-CP5 Comparator

L1-L5 Light emitting diode

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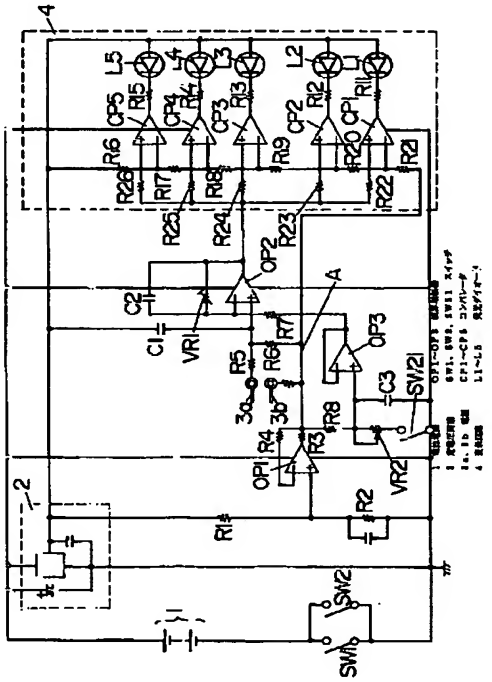
(54)【発明の名称】　水質チェッカ回路

(57)【要約】
【課題】アルカリ度合も塩素濃度もチェックすることができ、しかも表示手段により、水質の評価表示する場合に、塩素濃度、アルカリ度合の何れの測定時にも同じ表示手段によって評価表示することができる水質チェッカ回路を提供することにある。
【解決手段】アルカリ度合の測定時にスイッチＳＷ２をオンすれば、スイッチＳＷ２のオン動作に連動してスイッチＳＷ２１がオンし、演算増幅器ＯＰ３の非反転入力端の電圧が、抵抗Ｒ８と可変抵抗器ＶＲ２で分圧された電圧となるため、塩素濃度測定時に比して演算増幅器ＯＰ３の出力端の電位がラインＡの電位よりもマイナス方向に低くなる。



【特許請求の範囲】
【請求項１】電源と、異種の金属により構成され、検知対象の液中に浸けられたときに電圧を発生して検知信号として出力する一対の電極と、塩素濃度の検知対象の液中に浸けたときに起電圧のマイナス側となり、アルカリ度合の検知対象の液中に浸けたときに起電圧のプラス側となる一方の電極を接続する接続ラインの電位を上記電源のマイナスグランドから見て一定の電位に保持する手段と、上記検知信号を非反転入力端に入力し、出力端と反転入力端に接続した抵抗と反転入力端とグランドとの間に接続した抵抗とで定まる利得で検知信号を非反転増幅する信号増幅用の演算増幅器と、上記電源のプラス極と上記接続ラインとの間に接続された複数の抵抗の直列回路によって構成される分圧回路から出力される複数の異なる分圧出力に対応して設けられて、異なる分圧出力により基準電圧が夫々設定され、該基準電圧と上記演算増幅器から出力される検知信号電圧とを比較する複数のコンパレータと、該各コンパレータに対応して設けられて各コンパレータの出力端と上記電源との間に接続され、上記対応するコンパレータの出力に応じて駆動され、検知結果を表示する表示手段とを備えるとともに、上記演算増幅器のグランドの電位を塩素濃度測定時には上記接続ラインの電位とし、アルカリ度合測定時には上記接続ラインの電位よりもマイナス方向に低く切換設定する手段を備えて測定するアルカリ度合が所定以上高い場合から所定以下に至るまでと測定する塩素濃度が略零の場合から所定濃度以上に至るまでの上記演算増幅器から出力する検知信号電圧の変化が略同じとなるように上記演算増幅器の利得を設定したことを特徴とする水質チェッカ回路。
【請求項２】上記接続ラインの電位を一定に保持する手段を、上記電源の電圧を所定電圧に降圧した電圧を非反転入力端に入力して略同じ電圧を出力に発生するように利得が設定された非反転増幅器を構成する別の演算増幅器により構成し、該別の演算増幅器の出力端に上記接続ラインを接続して成ることを特徴とする請求項１記載の水質チェッカ回路。
【請求項３】上記切換手段として、反転入力端と出力端が接続された他の演算増幅器と、該他の演算増幅器の非反転入力端に入力する電圧を上記接続ラインの電圧とこの接続ラインよりも低い電圧とに切り換える電圧切換手段とから構成し、上記他の演算増幅器の出力端の電位を上記信号増幅用の演算増幅器のグランド電位としたことを特徴とする請求項１又は２記載の水質チェッカ回路。
【請求項４】上記各コンパレータの非反転入力端に上記信号増幅用の演算増幅器からの検知信号電圧を、上記各コンパレータの反転入力端に基準電圧を夫々入力し、基準電圧より入力する検知信号電圧が低いコンパレータをオンして上記表示手段を動作させることを特徴とする請求項１乃至３の何れか記載の水質チェッカ回路。
【請求項５】上記電源が電池電源を安定化する定電圧回路の出力により構成して成ることを特徴とする請求項１乃至４の何れか記載の記載の水質チェッカ回路。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は水道水の塩素濃度や、アルカリ生成水のアルカリ度合の何れのチェックにも使える水質チェッカ回路に関するものである。
【０００２】
【従来の技術】従来液中の塩素濃度或いはアルカリ度合を一対の電極の起電圧によってチェックするものがあるが、塩素濃度を測定する場合と、アルカリ度合の測定時とで電極間の起電圧の方向が逆であるため、塩素濃度が略零、つまりきれいな水と、アルカリ度合が所定以上ある液とが共に”良”と評価するような場合において、同一の発光ダイオードを用いて”良”であることを評価表示しようとすると、起電圧の方向が逆であるため検知信号処理のための回路構成が複雑になるという問題があった。
【０００３】
【発明が解決しようとする課題】本発明は、上述の問題点に鑑みて為されたもので、その目的とするところは、アルカリ度合も塩素濃度もチェックすることができ、しかも表示手段により、水質の評価表示する場合に、塩素濃度、アルカリ度合の何れの測定時にも同じ表示手段によって評価表示することができる水質チェッカ回路を提供することにある。
【０００４】
【課題を解決するための手段】上記の目的を達成するために、請求項１の発明では、電源と、異種の金属により構成され、検知対象の液中に浸けられたときに電圧を発生して検知信号として出力する一対の電極と、塩素濃度の検知対象の液中に浸けたときに起電圧のマイナス側となり、アルカリ度合の検知対象の液中に浸けたときに起電圧のプラス側となる一方の電極を接続する接続ラインの電位を上記電源のマイナスグランドから見て一定の電位に保持する手段と、上記検知信号を非反転入力端に入力し、出力端と反転入力端に接続した抵抗と反転入力端とグランドとの間に接続した抵抗とで定まる利得で検知信号を非反転増幅する信号増幅用の演算増幅器と、上記電源のプラス極と上記接続ラインとの間に接続された複数の抵抗の直列回路によって構成される分圧回路から出力される複数の異なる分圧出力に対応して設けられて、異なる分圧出力により基準電圧が夫々設定され、該基準電圧と上記演算増幅器から出力される検知信号電圧とを比較する複数のコンパレータと、該各コンパレータに対応して設けられて各コンパレータの出力端と上記電源との間に接続され、上記対応するコンパレータの出力に応じて駆動され、検知結果を表示する表示手段とを備えるとともに、上記演算増幅器のグランドの電位を塩素濃度

測定時には上記接続ラインの電位とし、アルカリ度合測定時には上記接続ラインの電位よりもマイナス方向に低く切換設定する手段を備えて測定するアルカリ度合が所定以上高い場合から所定以下に至るまでと測定する塩素濃度が略零の場合から所定濃度以上に至るまでの上記演算増幅器から出力する検知信号電圧の変化が略同じとなるように上記演算増幅器の利得を設定したことを特徴とする。

【０００５】請求項２の発明では、請求項１の発明において、上記接続ラインの電位を一定に保持する手段を、上記電源の電圧を所定電圧に降圧した電圧を非反転入力端に入力して略同じ電圧を出力に発生するように利得が設定された非反転増幅器を構成する別の演算増幅器により構成し、該別の演算増幅器の出力端に上記接続ラインを接続して成ることを特徴とする。

【０００６】請求項３の発明では、請求項１又は２の発明において、上記切換手段として、反転入力端と出力端が接続された他の演算増幅器と、該他の演算増幅器の非反転入力端に入力する電圧を上記接続ラインの電圧とこの接続ラインよりも低い電圧とに切り換える電圧切換手段とから構成し、上記他の演算増幅器の出力端の電位を上記信号増幅用の演算増幅器のグランド電位としたことを特徴とする。

【０００７】請求項４の発明では、請求項１乃至３の何れかの発明において、上記各コンパレータの非反転入力端に上記信号増幅用の演算増幅器からの検知信号電圧を、上記各コンパレータの反転入力端に基準電圧を夫々入力し、基準電圧より入力する検知信号電圧が低いコンパレータをオンして上記表示手段を動作させることを特徴とする。

【０００８】請求項５の発明では、請求項１乃至４の何れかの発明において、上記電源が電池電源を安定化する定電圧回路の出力により構成して成ることを特徴とする。

【０００９】

【発明の実施の形態】以下本発明を一実施形態により説明する。

【００１０】図１は本実施形態の回路を示しており、図において、乾電池、二次電池等の電池電源１に対して塩素濃度測定開始用スイッチＳＷ１とアルカリ度合の測定開始用スイッチＳＷ２との並列回路を介して汎用ＩＣ等からなる定電圧回路２を接続し、この定電圧回路２により安定化した電源電圧を得、この電圧を抵抗Ｒ１，Ｒ２の抵抗分圧回路により分圧して非反転増幅器を構成する演算増幅器ＯＰ１の非反転入力端に印加し、この演算増幅器ＯＰ１の出力端と反転入力端との間に接続した抵抗Ｒ３、Ｒ４の直列回路の中点電位を、水質評価を段階的に表示するための表示回路４のコンパレータＣＰ１～ＣＰ５の基準電圧のグランドレベルとするとともに、センサ用電極３ａ、３ｂ間に発生する起電力による検出信号電圧のグランドレベルとしている。

【００１１】電極３ａ、３ｂ間には抵抗Ｒ５，Ｒ６の直列回路を接続し、該直列回路の中点を検出信号増幅用の演算増幅器ＯＰ２の非反転入力端に接続してある。この非反転入力端はコンデンサＣ１を介して上記定電圧回路２の出力端のプラス極側にも接続してある。

【００１２】演算増幅器ＯＰ２は非反転増幅器を構成し、出力端と反転入力端との間には可変抵抗器ＶＲ１、応答調整用のコンデンサＣ２からなる並列回路を接続してあり、この可変抵抗器ＶＲ１の抵抗値と、反転入力端とグランド（基準）となる後述する演算増幅器ＯＰ３の出力端との間に接続した抵抗Ｒ７とで利得が設定され、該利得は可変抵抗器ＶＲ１で調整することができるようになっている。

【００１３】また一方上記抵抗Ｒ３，Ｒ４の直列回路の中点と、電池電源１のマイナス極との間には抵抗Ｒ８を介して可変抵抗器ＶＲ２とスイッチＳＷ２１の直列回路を接続するとともに、可変抵抗器ＶＲ２，スイッチＳＷ２１の直列回路にノイズ除去用コンデンサＣ３を接続し、抵抗Ｒ８と可変抵抗器ＶＲ２の接続点に演算増幅器ＯＰ３の非反転入力端を接続してある。

【００１４】この演算増幅器ＯＰ３は、ボルテージフォロアの非反転増幅器を構成し、非反転入力端の入力電圧と、出力電圧とが等しく、その出力端を抵抗Ｒ７を介して上記演算増幅器ＯＰ２の反転入力端に接続し、演算増幅器ＯＰ２のグランドの電位を出力端の電位に設定するようになっている。

【００１５】上記スイッチＳＷ２１はアルカリ度合測定開始用スイッチＳＷ２のオン／オフに連動してオン／オフするスイッチであって、演算増幅器ＯＰ２の入力電圧の切換手段を構成する。

【００１６】表示回路４は５つのコンパレータＣＰ１～ＣＰ５、このコンパレータＣＰ１～ＣＰ５の出力端と定電圧回路２の出力端のプラス極との間に限流抵抗Ｒ１１～Ｒ１５を介して接続された表示手段を構成する発光ダイオードＬ１～Ｌ５等から構成されている。そして上記定電圧回路２の出力端のプラス極と、上記抵抗Ｒ３，Ｒ４の直列回路の中点との間に同一抵抗値の抵抗Ｒ１６～Ｒ２１の直列回路からなる分圧回路を接続し、抵抗Ｒ２１と抵抗Ｒ２０との接続点の分圧電圧をコンパレータＣＰ１の反転入力端に基準電圧として接続し、また抵抗Ｒ２０と抵抗Ｒ１９との接続点の分圧電圧をコンパレータＣＰ２の反転入力端に基準電圧として接続し、更に抵抗Ｒ１９と抵抗Ｒ１８との接続点の分圧電圧をコンパレータＣＰ３の反転入力端に基準電圧として接続し、同様に抵抗Ｒ１８と抵抗Ｒ１７との接続点の分圧電圧をコンパレータＣＰ４の反転入力端に基準電圧として接続し、更に抵抗Ｒ１７と抵抗Ｒ１６との接続点の分圧電圧をコンパレータＣＰ５の反転入力端に基準電圧として接続しており、コンパレータＣＰ１の基準電圧からコンパレータ

ＣＰ５の基準電圧までを順次段階的に高めてある。

【００１７】一方コンパレータＣＰ１～ＣＰ５の非反転入力端には、夫々抵抗Ｒ２２～Ｒ２６を介して上記演算増幅器ＯＰ２の出力端を接続してあり、これら抵抗Ｒ２２～Ｒ２６は同じ抵抗値のものが使用されている。

【００１８】図２は本発明水質チェッカ回路を用いた水質チェッカの外観を示すものであって、樹脂成形品からなるハウジング５は図１で示す回路及び電池電源１を内装するとともに、外面にスイッチＳＷ１及びＳＷ２の操作部や表示回路４の発光ダイオードＬ１～Ｌ５の発光部が露設された本体部６と、本体部６の前部から前方に突出するように形成された、先端部に一対の電極３ａ，３ｂからなるセンサ部が設けられているヘッド部７とから構成されている。

【００１９】このハウジング５は外因性内分泌撹乱化学物質（環境ホルモン）を含まない材質にて形成することが好ましく、例えばＡＢＳ樹脂等のような樹脂成形品にて形成される。

【００２０】またヘッド部７は前後方向に長い円筒状に形成されており、その内部の中空部は後端側にて本体部６内に連通し、前端側が前方に向けて開口している。ここで、ヘッド部７の前端部には、図４に示すように、開口の周縁の全周に亘って、前方に突出すると共にヘッド部７の外径寸法よりも小さい外径寸法を有する円筒状の嵌合リブ８が設けられており、この嵌合リブ８の外周面には全周に亘って嵌合凹部９が凹設されると共に、嵌合凹部９よりも前端側は嵌合凹部９よりも外周側に突出した嵌合凸部１０として形成されている。

【００２１】ヘッド部７の先端部には、ヘッド部７の内外の水密性を確保すると共に端子電極３ａ，３ｂを固定するための固定部材１１が装着されている。固定部材１１は環境ホルモンを含まない材質にて形成することが好ましく、例えばＡＢＳ樹脂等のような樹脂成形品にて形成されるものであり、円柱状に形成された係止部１２の前端側に係止部１２よりも小径の円筒状の突出部１３を形成し、係止部１２の後端側に係止部１２よりも小径の円筒状の挿入部１４を形成したものである。

【００２２】このとき突出部１３には前方に開口する前側凹部１５が形成され、挿入部１４には後方に開口する後側凹部２２が形成されているものであり、この前側凹部１５と後側凹部２２とは係止部１２によって仕切られている。

【００２３】またこの係止部１２には、前側凹部１５と後側凹部２２とを連通する二つの挿通孔１６が形成されている。また、固定部材１１の挿入部１４の外周面には、全周に亘る凹溝１７が形成されている。

【００２４】この固定部材１１は、図２に示すように挿入部１４をハウジング５のヘッド部７の前端開口から挿入することによりヘッド部７の前端に取り付けられるものであり、このとき挿入部１４にＯリング１８を取着することにより挿入部１４の外面とヘッド部７の内面との間の水密性を確保することができる。

【００２５】また更に挿入部１４の外面とヘッド部７の内面との間の隙間に接着剤を充填してヘッド部７と固定部材１１とを接着することにより、固定部材１１をヘッド部７に対して強固に固定すると共に挿入部１４の外面とヘッド部７の内面との間の水密性を更に向上することができる。

【００２６】ヘッド部７の中空部内には二本のリード線１９ａ，１９ｂが配設されており、各リード線１９ａ，１９ｂの後端部はハウジング５の本体部６に引き出されて制御部に接続され、前端部は固定部材１１に固定されている。また二本のリード線１９ａ，１９ｂの先端にはそれぞれ電極３ａ，３ｂが接続されている。

【００２７】ここで、リード線１９ａ，１９ｂは固定部材１１の係止部１２の挿通孔１６に挿通されて後端側が挿入部１４の後側凹部２２内から後端開口を介して固定部材１１の後方に引き出されている。またリード線１９ａ，１９ｂの先端の末端部には挿通孔１６の内径よりも大きい球状の瘤部２０が形成されており、この瘤部２０によってリード線１９ａ，１９ｂの先端は突出部１３の前側凹部１５内において係止部１２の前面側に係止されている。このリード線１９ａ，１９ｂの先端の瘤部２０にはそれぞれ線状の電極３ａ，３ｂの後端が埋設されており、これによりリード線１９ａ，１９ｂの先端には電極３ａ，３ｂが接続されている。各電極３ａ，３ｂは先端側は固定部材１１の突出部１３の前側凹部１５の開口から前方に突出するように配設されている。

【００２８】また固定部材１１の挿入部１４の後側凹部２２内には封止材２１が充填されており、これにより固定部材１１の挿入部１４の後側凹部２２内においてリード線１９ａ，１９ｂが固定されている。また固定部材１１の突出部１３の前側凹部１５内にも封止材２３が充填されており、これによりこれ固定部材１１の突出部１３の前側凹部１５内において電極３ａ，３ｂが固定されている。また、これらの封止材２３，１９によって、固定部材１１の前端側と後端側との間の水密性が確保される。

【００２９】一対の電極３ａ，３ｂは、一方の電極３ｂが白金線、他方の電極３ａが銀線にて形成されており、この電極３ａ，３ｂによって、センサ部が構成されている。各電極３ａ，３ｂは後端側は固定部材１１の突出部１３の前側凹部１５内において封止材２３内に埋設されている埋設部として形成され、前端側はこの封止材２３から前方に向けて突出する検知部位として形成されている。

【００３０】銀線からなる電極３ａには検知端子部７の表面のみに塩化銀被膜が形成され、埋設部の表面には塩化銀被膜は形成されていないものであり、このため、電極３ａとリード線１９ａとの接続部には塩化銀被膜は形

成されることがなく、電極３ａとリード線１９ａとの電気的接続が塩化銀被膜によって阻害されることがないものである。

【００３１】更に、ヘッド部７の先端には、固定部材１１及び電極３ａ，３ｂの検知端子部７を覆うようにキャップ体２４が設けられ、これにより検知端子部７の保護が行なわれる。このキャップ体２４は図３に示すように、前端側が閉塞すると共に後端側が開口した有底円筒状に形成されており、その外径寸法はヘッド部７の外径寸法と略同一に形成される。またキャップ体２４の後端部は、内径寸法が前端側よりも大きくかつ固定部材１１の係止部１２の外径と略同一の寸法に形成された、被嵌合リブ２５として形成されており、この被嵌合リブ２５の後端部の内周面には全周に亘って、ヘッド部７の嵌合リブ８の嵌合凸部１０に合致する被嵌合凹部２６が形成されると共に、この被嵌合凹部２６よりも更に後端側は被嵌合凹部２６よりも内周側に突出した、嵌合リブ８の嵌合凹部９に合致する被嵌合凸部２７として形成されている。そしてキャップ体２４の被嵌合リブ２５を固定部材１１の係止部１２の外周側からヘッド部７の嵌合リブ８の外周側にかけて配置し、嵌合凹部９と被嵌合凸部２７とを嵌合させると共に嵌合凸部１０と被嵌合凹部２６とを嵌合させることにより、キャップ体２４がヘッド部７の前端に取り付けられるものであり、このとき嵌合リブ８と被嵌合リブ２５との間の隙間に接着剤を充填してキャップ体２４とヘッド部７とを接着することにより、キャップ体２４をヘッド部７に対して強固に固定すると共に嵌合リブ８と被嵌合リブ２５との間の水密性を確保することができるものである。

【００３２】このキャップ体２４には、二つの平行並列なスリット状の開口部２８が形成されており、この開口部２８により、キャップ体２４の内側と外側とが連通されている。この開口部２８はキャップ体２４の側面から前端面を通って反対側の側面に亘るように形成されている。またキャップ体２４には各開口部２８の両端部に、この開口部２８と連通すると共にキャップ体２４の内側と外側とを連通する連通孔２９が形成されており、この連通孔２９は各開口部２８の幅よりも大径に形成されている。

【００３３】このキャップ体２４のスリット状の開口部２８は、水質の測定時にキャップ体２４の内側に水道水等の検出対象の液体を侵入させて電極２の検知端子部７をこの液体に浸漬させたり、水質の測定後にキャップ体２４の内側から液体を排出したりするためのものである。

【００３４】また連通孔６は水質の測定時にキャップ体２４の内側から空気を排出してキャップ体２４の内側に検出対象の液体がスムーズに侵入するようにし、あるいは水質の測定後にキャップ体２４の内側に空気を侵入させてキャップ体２４の内側から液体がスムーズに排出されるようにするためのものである。

【００３５】次に本実施形態の水質チェッカ回路の動作について説明する。

【００３６】まず水道水の塩素濃度をチェックする場合には、スイッチＳＷ１をオンして、ヘッド部７を被検知対象液である水道水に浸ける。水道水に漬けられたキャップ体２４内の電極３ａ、３ｂ間には塩素濃度に応じて起電圧が発生する。この場合電極３ａがプラス極となって、起電圧によって抵抗Ｒ６には電圧が発生し、この電圧が検出信号でとして演算増幅器ＯＰ２に非反転入力端に入力され、非反転増幅される。

【００３７】一方定電圧回路２からの出力電圧が抵抗Ｒ１と、抵抗Ｒ２とで分圧されて降圧され、抵抗Ｒ２の両端電圧が演算増幅器ＯＰ１により非反転増幅される。ここで演算増幅器ＯＰ１の出力端と反転入両端に接続された抵抗Ｒ４、Ｒ３の抵抗値を、その中点に接続されている接続ラインＡの電圧が略抵抗Ｒ２の両端電圧に略等し入力電圧となるように設定してある。

【００３８】またスイッチＳＷ２１がオフ状態であるため演算増幅器ＯＰ３では出力端の電圧が非反転入力端に入力している電圧、つまり接続ラインＡの電圧と等しい電圧となる。従ってこの出力端の電位と、接続ラインＡの電位とが等しいため、演算増幅器ＯＰ２は可変抵抗器ＶＲ１の抵抗値と、反転入力端と演算増幅器ＯＰ３の出力端との間に接続した抵抗Ｒ７の抵抗値とで定まる利得により、抵抗Ｒ６の両端に発生する検出信号電圧を増幅する。

【００３９】この演算増幅器ＯＰ３により増幅された検出信号電圧は、表示回路４に入力されて、各コンパレータＣＰ１～ＣＰ５に設定される基準電圧と比較される。そして検出信号電圧が基準電圧を越えていないコンパレータにおいては、出力端を”Ｌ”レベルとし、出力端に接続されている発光ダイオードに発光電流を流す。つまり被測定水の塩素濃度が高ければ高い程、電極３ａ、３ｂ間に発生する起電圧が増加して、抵抗Ｒ６の両端電圧が高くなり、そのため基準電圧を越えるコンパレータの数が多くなり、発光する発光ダイオードの数が少なくなる。従って発光ダイオードＬ１～Ｌ５の全てが点灯している場合には塩素濃度が略零に近くて水質評価は”良”となり、その点灯数が少なくなればなるほど塩素濃度が高く、水質評価は”悪”であることが分かる。またヘッド部７を水道水に浸ける前に、スイッチＳＷ１を投入した時点からコンデンサＣ１が充電されその充電に伴ってゆっくりと発光ダイオードＬ１～５が順次点灯し、この点灯により動作チェックができることになるようになっている。この動作は塩素濃度測定時のみで、後述するアルカリ度合の測定時ではこの点灯動作は無い。

【００４０】さて本発明チェッカ回路は水道水の塩素濃度以外に、アルカリ生成水のアルカリ度合もチェックする事ができるもので、この場合、スイッチＳＷ２をオン

して検知対象液内に水道水の塩素濃度のチェックと同様にヘッド部７を浸ければよい。

【００４１】つまりスイッチＳＷ２のオン動作に連動してスイッチＳＷ２１がオンし、演算増幅器ＯＰ３の非反転入力端の電圧が、抵抗Ｒ８と可変抵抗器ＶＲ２で分圧された電圧に切り換えられるため、塩素濃度測定時に比して演算増幅器ＯＰ３の出力端の電位が接続ラインＡの電位よりもマイナス方向に低くなる。

【００４２】一方アルカリ測定時においては電極３ａ、３ｂ間の起電圧の方向が塩素濃度測定時とは反対方向となり、アルカリ度合が高くなれば成る程、演算増幅器ＯＰ２の非反転入力端に入力する検出信号電圧は接続ラインＡの電位に対してマイナス方向に大きくなる。

【００４３】ここでアルカリ度合が所定以上高い場合には発光ダイオードＬ１～Ｌ５を全点灯させ、アルカリ度合が所定度合より低い場合には全消灯させるように、上記演算増幅器ＯＰ３の出力端の電位を、可変抵抗器ＶＲ２により設定しておくことにより、アルカリ度合が所定以上高い程と、演算増幅器ＯＰ３の非反転入力端に入力する検出信号電圧が接続ラインＡを基準としてマイナス方向に増大するが、演算増幅器ＯＰ３の出力端の電位を接続ラインＡの電位よりもマイナス方向に十分大きくすることで、検知信号が入力する演算増幅器ＯＰ２の非反転入力端と、グランドとの間の電位差が小さくなり、演算増幅器ＯＰ２の出力端から出力される増幅された検出信号電圧は接続ラインＡの電圧に対して略近い値となる。これによって、アルカリ度合が所定以上ある場合には、全てのコンパレータＣＰ１～ＣＰ５の非反転入力端の入力電圧が基準電圧を下回って、コンパレータＣＰ１～ＣＰ５の出力が全て”Ｌ”レベルとなり、全発光ダイオードＬ１～Ｌ５が点灯する。

【００４４】また検知対象の液のアルカリ度合が低くなれば成る程、マイナス方向の起電圧が小さくなり、演算増幅器ＯＰ２の非反転入力端に入力するマイナス方向の検出信号電圧は小さくなり、演算増幅器ＯＰ２の非反転入力端と、グランドとの間の電位差が大きくなり、演算増幅器ＯＰ３の出力端から出力される増幅された検出信号電圧は大きくなる。従って被測定液のアルカリ度合が高ければ高い程、非反転入力端の電圧が基準電圧を越えるコンパレータの数が多くなって、発光する発光ダイオードの数が少なくなる。つまり発光ダイオードＬ１～Ｌ５の全てが点灯している場合にはアルカリ度合が所定以上あって水質評価が”良”で、逆にその点灯数が少なくなればなるほどアルカリ度合が小さくなって水質評価が”悪”となっていることが分かる。

【００４５】尚本実施形態では発光ダイオードＬ１～Ｌ５の点灯数で水質評価を表示するようになっているが、液晶表示器等を用いて表示するようにしても良い。

【００４６】

【発明の効果】請求項１の発明は、電源と、異種の金属により構成され、検知対象の液中に浸けられたときに電圧を発生して検知信号として出力する一対の電極と、塩素濃度の検知対象の液中に浸けたときに起電圧のマイナス側となり、アルカリ度合の検知対象の液中に浸けたときに起電圧のプラス側となる一方の電極を接続する接続ラインの電位を上記電源のマイナスグランドから見て一定の電位に保持する手段と、上記検知信号を非反転入力端に入力し、出力端と反転入力端に接続した抵抗と反転入力端とグランドとの間に接続した抵抗とで定まる利得で検知信号を非反転増幅する信号増幅用の演算増幅器と、上記電源のプラス極と上記接続ラインとの間に接続された複数の抵抗の直列回路によって構成される分圧回路から出力される複数の異なる分圧出力に対応して設けられて、異なる分圧出力により基準電圧が夫々設定され、該基準電圧と上記演算増幅器から出力される検知信号電圧とを比較する複数のコンパレータと、該各コンパレータに対応して設けられて各コンパレータの出力端と上記電源との間に接続され、上記対応するコンパレータの出力に応じて駆動され、検知結果を表示する表示手段とを備えるとともに、上記演算増幅器のグランドの電位を塩素濃度測定時には上記接続ラインの電位とし、アルカリ度合測定時には上記接続ラインの電位よりもマイナス方向に低く切換設定する手段を備えて測定するアルカリ度合が所定以上高い場合から所定以下に至るまでと測定する塩素濃度が略零の場合から所定濃度以上に至るまでの上記演算増幅器の検知信号電圧の変化が略同じとなるように上記演算増幅器の利得を設定したので、水道水の塩素濃度の略零の場合から所定濃度に至るまでの水質の評価表示と、アルカリ生成水などアルカリ度合の所定以上から所定以下に至るまでの水質の評価表示とが同じ表示手段により行うことができ、しかもコンパレータ等を切替えることなく行えるため、同一の電極と簡単な回路構成により塩素濃度の測定と、アルカリ度合の測定とが行える水質チェッカ回路を実現できるという効果がある。

【００４７】請求項２の発明は、請求項１の発明において、上記接続ラインの電位を一定に保持する手段を、上記電源の電圧を所定電圧に降圧した電圧を非反転入力端に入力して略同じ電圧を出力に発生するように利得が設定された非反転増幅器を構成する別の演算増幅器により構成し、該別の演算増幅器の出力端に上記接続ラインを接続してあるので、検知信号電圧のグランドの電位を一定に保持する回路が簡単に実現できる。

【００４８】請求項３の発明は、請求項１又は２の発明において、上記切換手段として、反転入力端と出力端が接続された他の演算増幅器と、該他の演算増幅器の非反転入力端に入力する電圧を上記接続ラインの電圧とこの接続ラインよりも低い電圧とに切り換える電圧切換手段とから構成し、上記他の演算増幅器の出力端の電位を上記信号増幅用の演算増幅器のグランド電位としたので、

演算増幅器と、簡単な電圧切換手段とで、塩素濃度測定時とアルカリ度合の測定時とを同じ信号増幅用の演算増幅器と、コンパレータと、同じ表示手段によって、同じように水質の評価表示が行える回路を実現できる。

【００４９】請求項４の発明は、請求項１乃至３の何れかの発明において、上記各コンパレータの非反転入力端に上記信号増幅用の演算増幅器からの検知信号電圧を、上記各コンパレータの反転入力端に基準電圧を夫々入力し、基準電圧より入力する検知信号電圧が低いコンパレータをオンして上記表示手段を動作させるので、塩素濃度測定時に測定前の動作チェックができるという効果がある。

【００５０】請求項５の発明では、請求項１乃至４の何れかの発明において、上記電源が電池電源を安定化する定電圧回路の出力により構成してあるので、電池電源によって動作する水質チェッカ回路を提供できる。

【図面の簡単な説明】

【図１】本発明の一実施形態の回路図である。

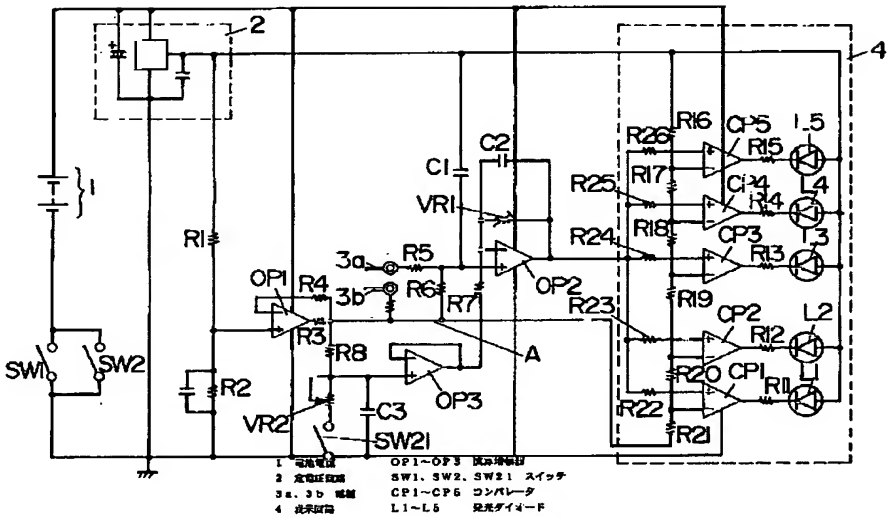
【図２】同上を使用した水質チェッカの側面図である。

【図３】（ａ）は同上を使用した水質チェッカのヘッド部の一部省略せる拡大断面図である。（ｂ）は同上を使用した水質チェッカのヘッド部の一部省略せる拡大側面図である。

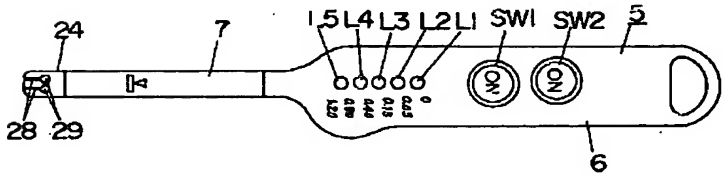
【符号の説明】

１　電池電源
２　定電圧回路
３ａ、３ｂ　電極
４　表示回路
ＯＰ１～ＯＰ３　演算増幅器
ＳＷ１、ＳＷ２、ＳＷ２１　スイッチ
ＣＰ１～ＣＰ５　コンパレータ
Ｌ１～Ｌ５　　発光ダイオード

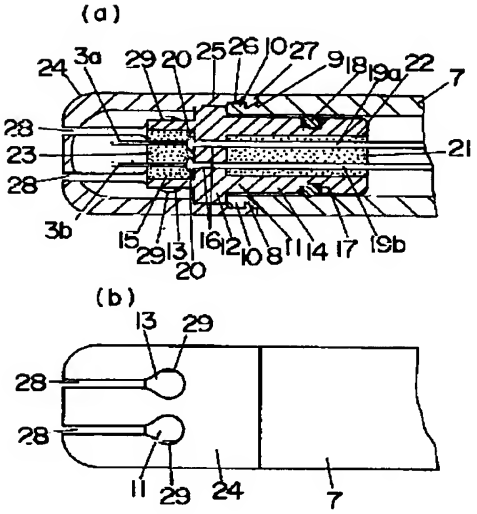
【図１】



【図２】



【図3】


(a)
24
3a
29
20
25
26
10
27
9
18
19a
22
7
28
23
28
21
3b
15
29
13
20
16
12
10
8
11
14
17
19b
(b)
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29
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28
11
29
24
7